

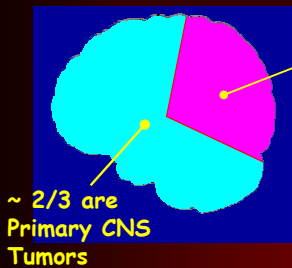
Common Adult Brain Tumors

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Educational Objectives

- Distinguish Intraaxial from Extraaxial
- Circumscribed vs. Diffuse Astrocytoma
- Grades of Diffuse Astrocytoma
- Natural Hx of Astrocytoma
- Limitations of Surgery for Diffuse Astro
- Primary CNS Lymphoma

Brain Neoplasia: Frequency*



~ 1/3 are
Metastatic
CNS Tumors

~ 2/3 are
Primary CNS
Tumors

Levin VA et al.
Cancer: Principles & Practice of Oncology.
1997: 2022 - 2082.

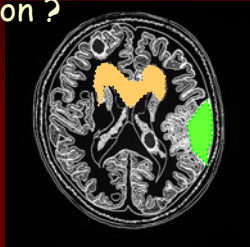
Primary CNS Neoplasms

- Primary
 - Intraaxial
 - Astrocytoma (Glioma)
 - Circumscribed
 - Diffuse
 - Lymphoma
 - Neuronal
 - Extraaxial
 - Meningioma
 - Schwannoma
 - Pituitary

Lesion Location

Where is the lesion ?

- Intraaxial
- Extraaxial



WHO Classification of Tumors

Tumors of neuroepithelium

Astrocytomas

- Oligodendrogliomas
- Mixed gliomas
- Ependymomas
- Glial tumors- uncertain origin
- Neuronal tumors & mixed neuronal glial tumors
- Embryonal tumors

} Gliomas

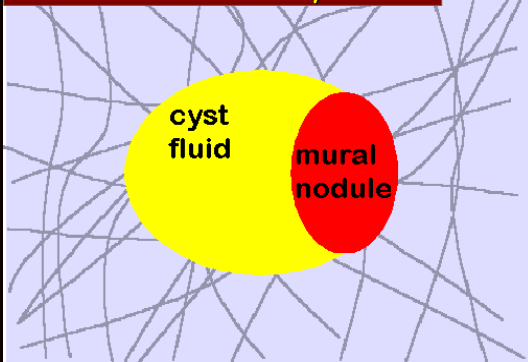
Lymphomas & hematopoietic tumors

Metastases

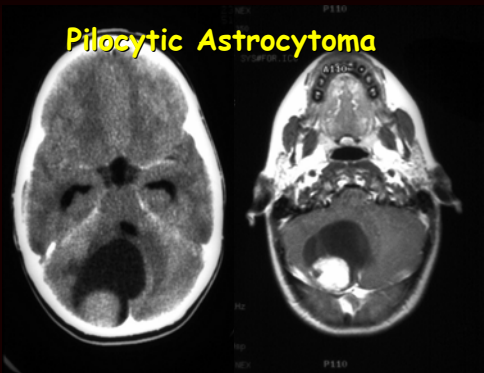
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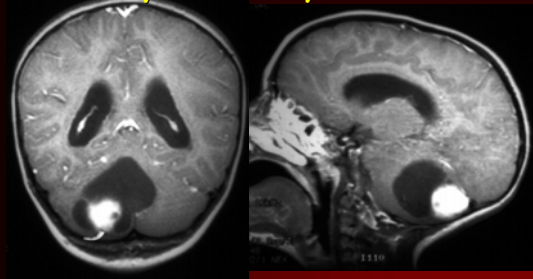
Circumscribed Astrocytoma



Pilocytic Astrocytoma



Pilocytic Astrocytoma



PILOCYTIC ASTROCYTOMA

Radiology

- Cerebellum, Diencephalon
 - rare in BS or Cerebrum
- Majority have significant "cyst"
 - "Cyst and Mural Nodule"
 - part of lining does NOT enhance
 - Nodule may be heterogeneous
 - Exceptional purely solid
- Nodule NOT hyperdense
- Calcification in 5-25%

PATHOLOGY

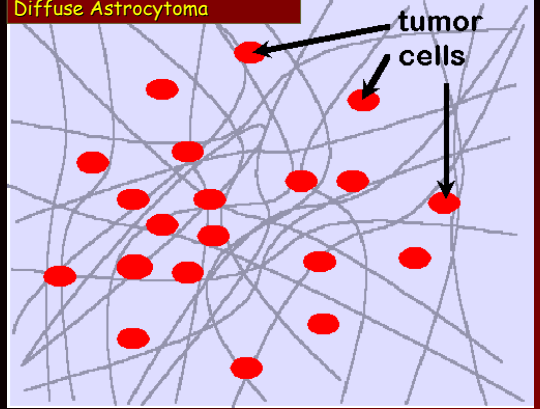
- Biphasic pattern
 - dense pilocytic glia
 - Rosenthal fibers
 - loose microcystic areas
- No necrosis
- Low grade
- Abnormal capillaries
 - allow enhancement
 - fluid production



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Diffuse Astrocytoma



Astrocyte Mutation

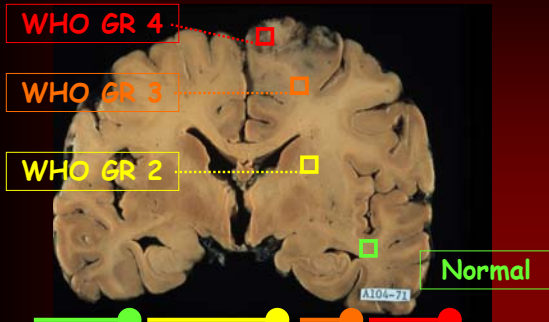
- Normal Astrocyte
- Neoplastic
- Anaplastic
- GBM



Diffuse Astrocytoma: Enlarged Hemisphere



Diffuse Astrocytoma

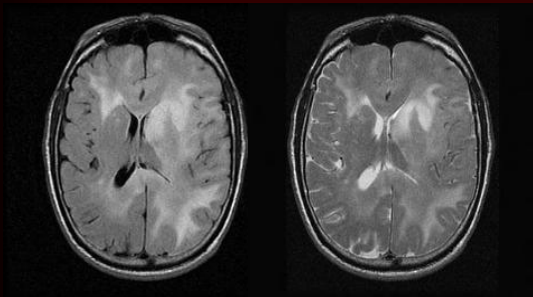


Astrocytoma WHO Gr 2

- Increased brain volume
 - Cellularity of white matter
- NO Neovascularity
 - Not allowed by WHO grading
 - Intact normal vessels
 - No enhancement
 - No vasogenic edema
- Homogeneous
 - Microcystic change

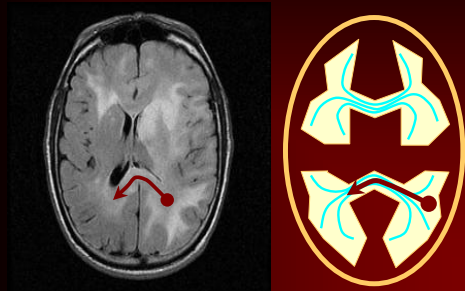
Gliomatosis Cerebri

Radiology - <http://rad.usuhs.mil>



White Matter Tracts

Radiology - <http://rad.usuhs.mil>



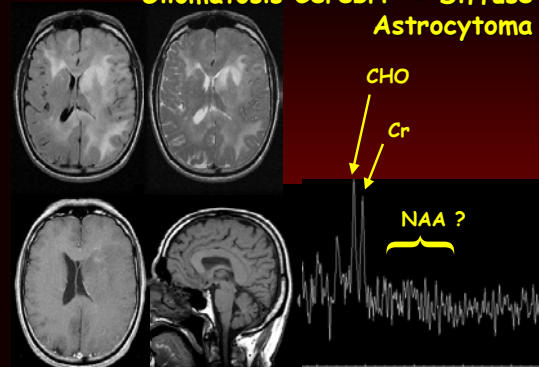
Gliomatosis Cerebri

Radiology - <http://rad.usuhs.mil>



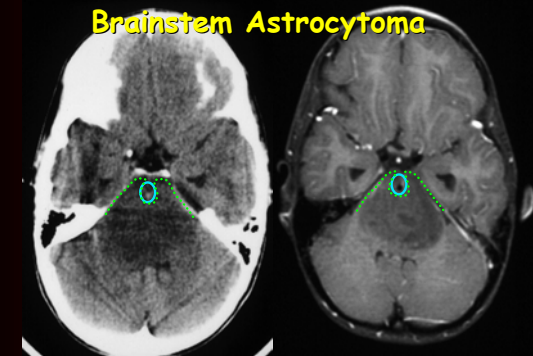
"Gliomatosis Cerebri" = Diffuse Astrocytoma

Radiology - <http://rad.usuhs.mil>



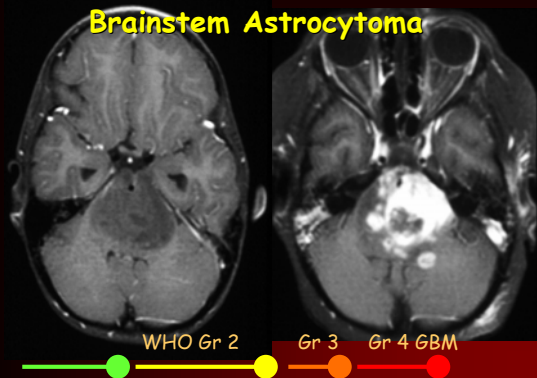
Brainstem Astrocytoma

Radiology - <http://rad.usuhs.mil>

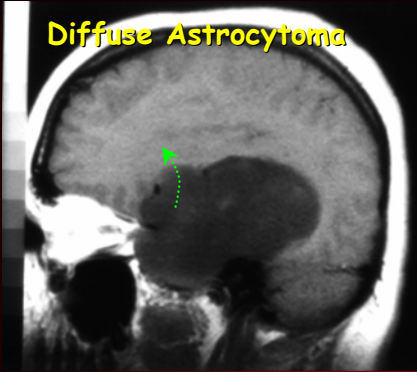


Brainstem Astrocytoma

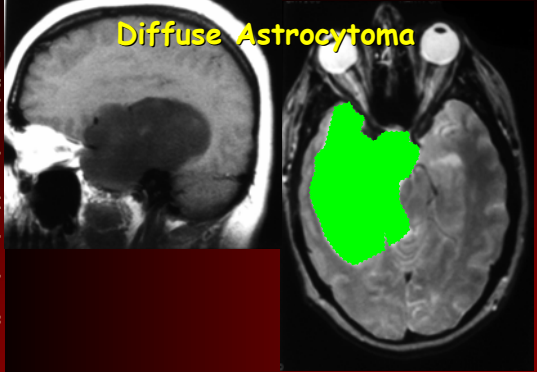
Radiology - <http://rad.usuhs.mil>



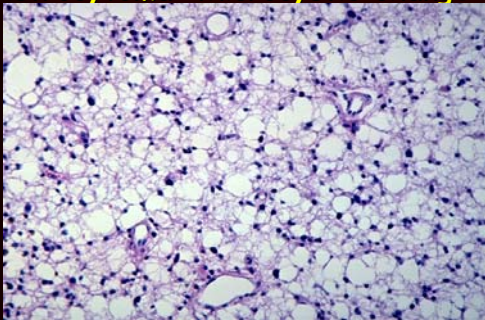
Diffuse Astrocytoma



Diffuse Astrocytoma



Astrocytoma: Microcystic change



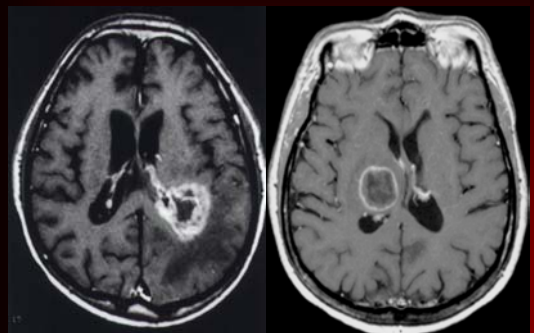
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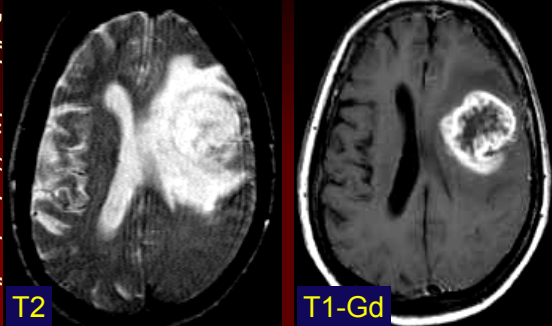
Astrocytoma WHO Gr 4

- Glioblastoma multiforme
- Aggressive hypervascular mass
 - Abnormal arteries and veins
 - "Glomeruloid" capillaries
 - Incr. rCBV, rCBF, short MTT
 - Absent BBB
- Heterogeneous
 - Necrosis, vascular rim with tumor
 - Surrounding edema and tumor
- Deceptive lesion
 - Looks focal ... but is diffusely infiltrating

Glioblastoma Multiforme

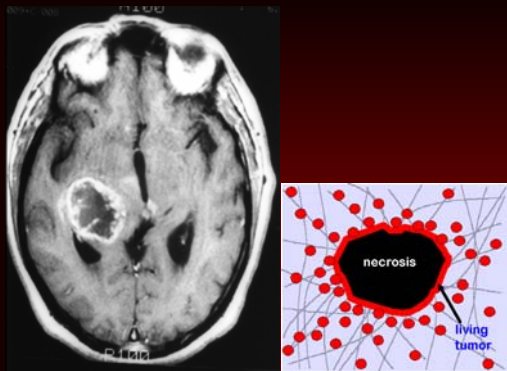


Glioblastoma Multiforme

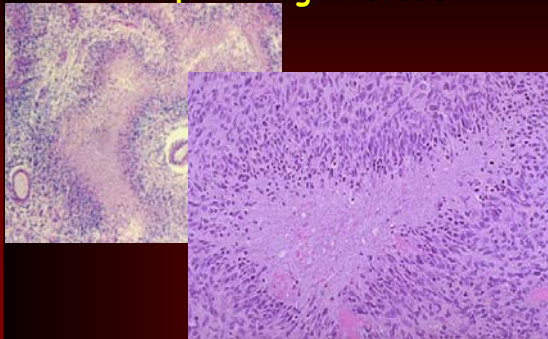


Diffuse Astrocytoma Spread

- We all see the enhancing hypercellular and hypervascular RIM
- Microscopically, cells spread through the white matter
- Corona of vasogenic edema has tumor
- But, tumor may extend beyond area of T2 abnormality
- MRS, DTI, Anisotropy may help



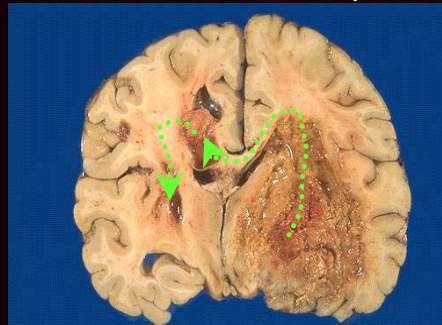
Pseudopalisading Necrosis



Pseudopalisading

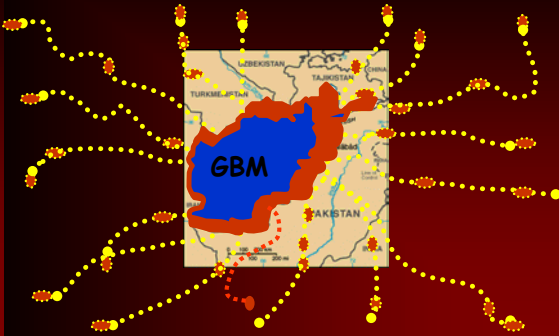


GBM: 5-15% are Multifocal



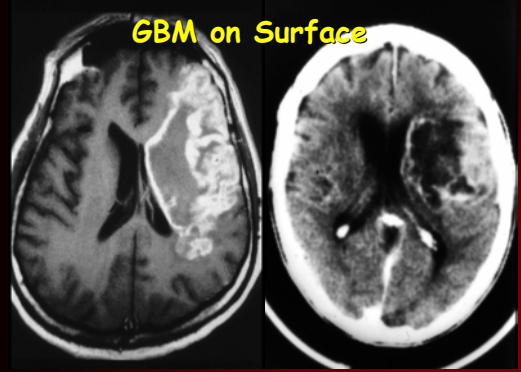
Terrorist Cells Infiltrate Brain

Radiology - <http://rad.usuhs.mil>



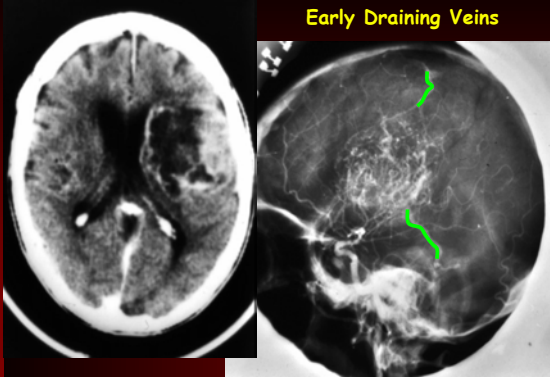
GBM on Surface

Radiology - <http://rad.usuhs.mil>



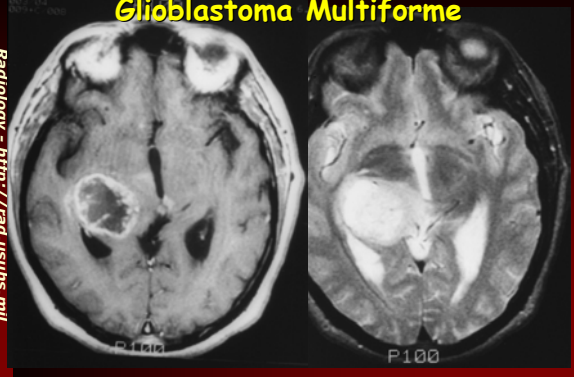
Early Draining Veins

Radiology - <http://rad.usuhs.mil>



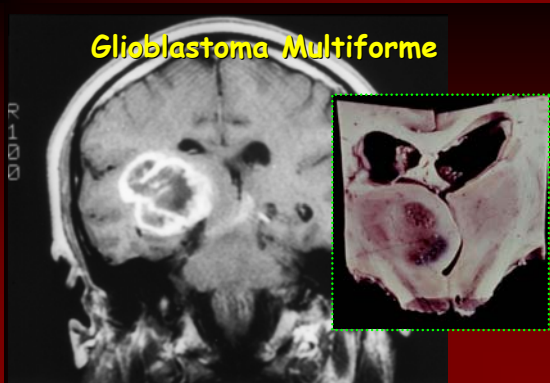
Glioblastoma Multiforme

Radiology - <http://rad.usuhs.mil>



Glioblastoma Multiforme

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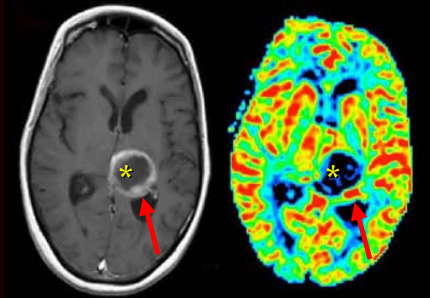


New Tools for Grading and Staging

- Radiology
 - Perfusion - rCBV
 - Diffusion and DTI
 - Spectroscopy
 - PET/SPECT
 - Monoclonal Ab.
- Pathology
 - Labeling Index
 - Chromosomes
 - Histochemical
 - Electron Microscopy

Radiology - <http://rad.usuhs.mil>

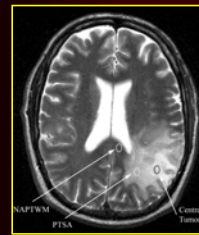
MR Perfusion Imaging



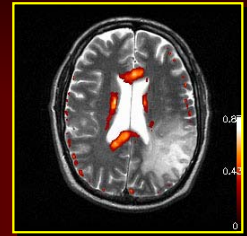
Glioblastoma Multiforme

Courtesy of James Provenzale, Duke University

DTI and Tumor Imaging



T2



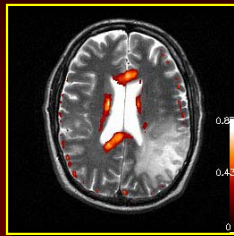
DTI

From: J. Burdette and Neeraj Chopuri, WFU

DTI and Tumor Imaging



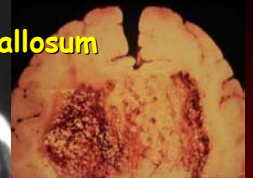
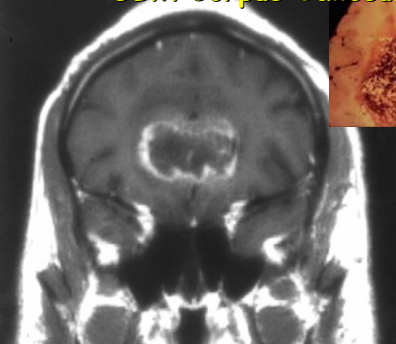
Schematic



DTI

From: J. Burdette and Neeraj Chopuri, WFU

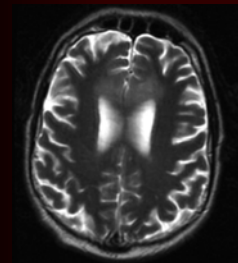
GBM Corpus Callosum



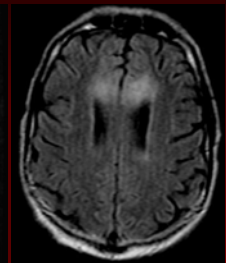
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Deep Periventricular Lesions



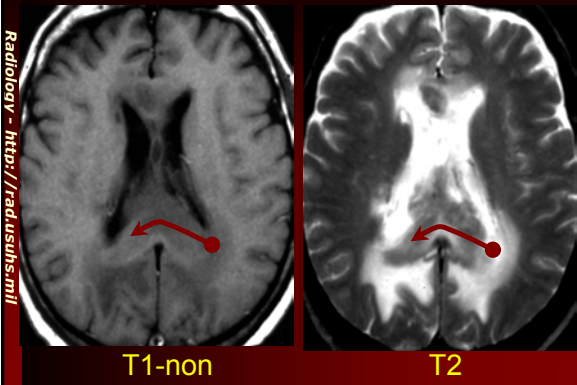
T2W



FLAIR

Courtesy V. Mathews, IA

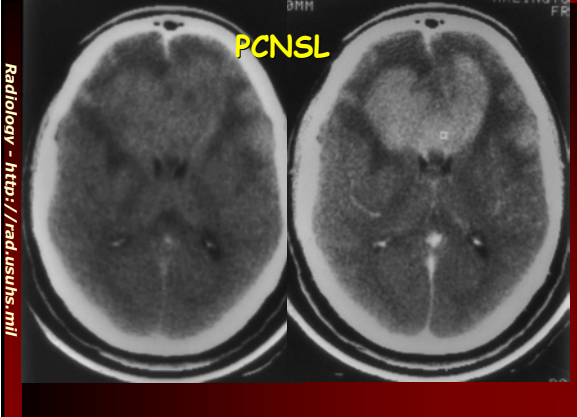
PCNSL: Immunocompetent



CNS Lymphoma

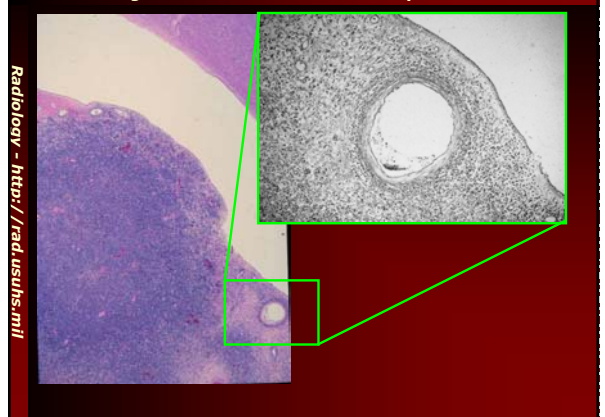
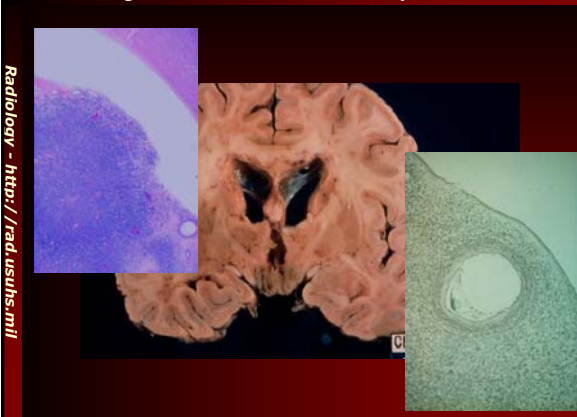
- Usually Parenchymal and paracentral
 - HUGS the Ventricles
- **Small Round Blue-cell Tumor**
 - CT => Fluffy high density lesions
 - MR => Gray matter (or lower) Signal
- Multifocal
- Rings are undulating and irregular
- Hypermetabolic (SPECT, Thallium)

PCNSL



Micro Pathology

- DENSELY CELLULAR
- Perivascular infiltration
- Increased RETICULIN fibers
- HIGH N/C (nuclear/cytoplasm)
- **Small Round Blue Cell Tumor**
- High attenuation/low signal intensity

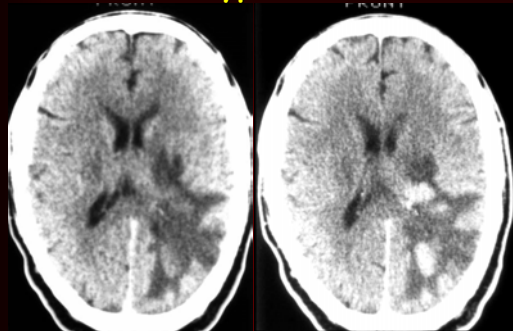


Small Round Blue Cell Tumor

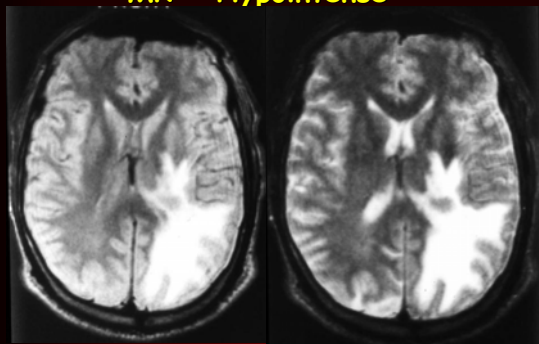


Perivascular
Infiltrate

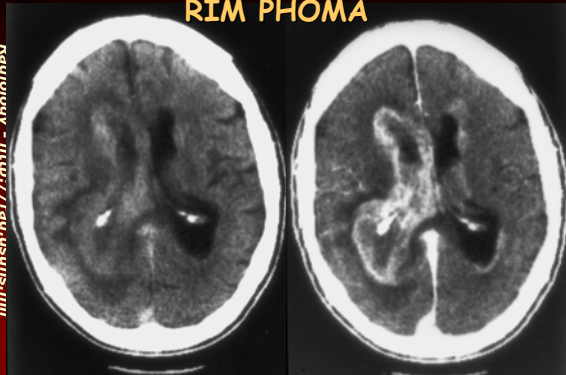
CT - Hyperdense



MR - Hypointense



RIM PHOMA



Rimphoma: It HUGS the Ventricles

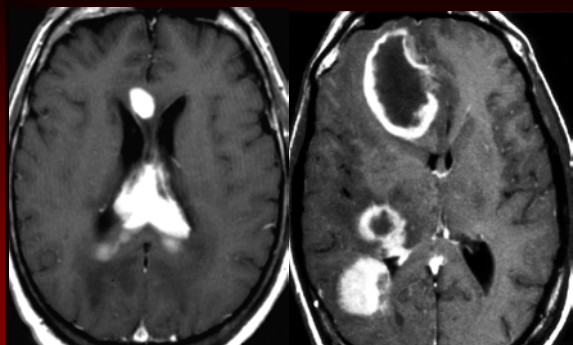


RIM PHOMA



PCNSL: NI vs. AIDS

Radiology - <http://rad.usuhs.mil>

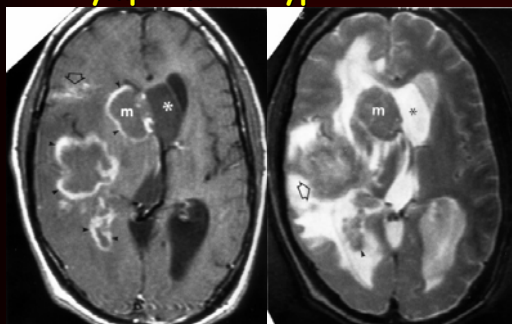


T1-gad

T1-gad

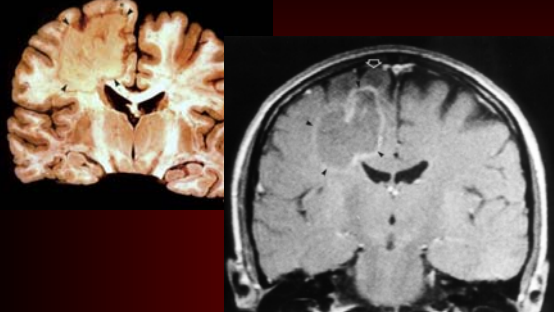
Lymphoma - Hypointense

Radiology - <http://rad.usuhs.mil>



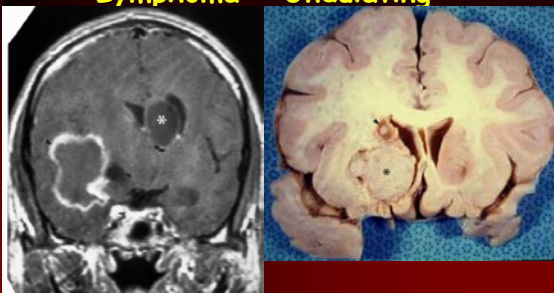
Lymphoma - Undulating

Radiology - <http://rad.usuhs.mil>



Lymphoma - Undulating

Radiology - <http://rad.usuhs.mil>



Relapse after Tx

Radiology - <http://rad.usuhs.mil>

